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NRO REVIEW
COMPLETED

7 November 1966

TO: Distribution

FROM: [REDACTED]

SUBJECT: [REDACTED] LOW GAMMA EXPERIMENT

A conference was held [REDACTED] on 2 November to discuss the present status and action required to assess low gamma processing of on-orbit engineering photography. The conference was attended [REDACTED]

[REDACTED] distributed a summary of the printing and processing sensitometric data of the original negatives and duplicate positives. A copy of this report is included as Attachment 1.

[REDACTED] presented a review of the low gamma processing studies [REDACTED] and the problems that have been encountered. There is no present capability to conduct interrupted processing with the low gamma chemistry. There is some question as to the range and level of maximum resolution with low gamma processing. Since no data is available [REDACTED] requested to jointly perform a sensitometric-resolution test. The target types and contrast levels were agreed upon during the meeting. The final data is expected to be available within a month.

[REDACTED] discussed the problems of suitable equipment for low gamma processing. They feel that a viscous process can be developed but have not been instructed to proceed with this study. The [REDACTED] machine is not considered to have adequate reliability to process a full mission. It was proposed that a study be made to ascertain what types of processing equipment are available that are compatible with the low gamma solutions.

It was agreed that the duplication of the engineering photography for P.I. and contractor evaluation should be done using the same series of contrasts as listed in Attachment 1. The positive and negative characteristic curves are to cross in the 0.9 to 1.0 density range. [REDACTED] was requested to number the frames prior to duplicating.

The detailed test plan for the P.I. evaluation of the experiment is to be published [REDACTED] in one week. In general, the film will be divided into two groups of six spools. The two types of O.N. processing and the three types of D.P. processing comprises the six spools from one camera. The P.I.'s will be asked to place samples of each spool in order of preference and to rank each sample to a five step standard. The selected samples will be reviewed at the next PET meeting prior to the P.I. evaluation.

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The photography acquired during this mission is far superior to the [] photography for analysis of low gamma processing. Additional photography should be obtained of major cultural areas and military installations. The [] low gamma test has to be re-run due to an equipment malfunction. This data will be available in approximately eight weeks.

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The acquisition of engineering photography at the end of a normal "A" mission presents significant operational problems. [] stated that they were capable of measuring film to a 1% tolerance. It was felt that the tolerance is more than adequate to precisely locate engineering photography near the end of an "A" mission. Then appears to be no reason to restrict the removal of engineering photography to the tail end of the "A" spools.

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Encl: Attachment 1

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ATTACHMENT 1

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1. Approximately 100 ft. of imagery from both the FWD and AFT cameras were exposed during an engineering pass [] This material was removed during bucket unloading and set aside for special processing evaluations. Both the FWD and AFT 70mm material was slit into two 35mm sections. One part of each record was shipped [] for a special low gamma process [] the remaining parts with the FWD receiving intermediate development and the AFT full.

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2. Three levels of contrast were selected for duplicating the imagery. The printer-process system curves are shown in Figure 1. They are referred to as the Low (L), Medium (M) and High (H) contrast reproduction conditions.

3. All of the printing was accomplished with a [] printer and all of the processing with a [] processor.

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4. The negative process sensitometric curves are shown in Figures 2 and 3 respectively for the FWD and AFT portions respectively. The IT curves were obtained by redrawing the curves from a report from the IT facility.

5. The combined Scene Reproduction Average Contrast values (SRAC) are shown in Table 1. These are based on:

$$SRAC = (\text{negative gamma}) \times (\text{dupo. average gradient})$$

Dupo Avg. Grad.	Negative Gamma			
	2.24	2.42	1.92	1.92
	(F)	(A)	(F)	(A)
0.75	1.68	1.82	.78	.75
1.20	2.69	2.90	1.26	1.22
1.75	3.92	4.23	1.83	1.78

Table 1. SRAC Values

6. An attempt was made to print the duplicates at the conditions which made their intermediate density values nearly the same.

7. Twelve duplicates were made corresponding to the combinations of the six conditions shown in Table 1 and the two cameras (FWD and AFT). Each duplicate consists of the entire length of negative film and is in a separate can. The cans and film are labeled and can be identified as shown in Table 2.

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Can No.	Camera	SPAG	Printer Setting
1	F	1.68	.5
2	F	.78	.5
3	F	2.69	.7
4	F	1.26	.6
5	F	3.92	.9
6	F	1.89	.9
7	A	1.82	.4
8	A	.76	.5
9	A	2.90	.4
10	A	1.22	.7
11	A	4.23	.9
12	A	1.78	.9

Table 2. Can and Film Identification Information

8. A typical frame was selected and its duplicates were mounted in a transparent display.

9. Enlargements were prepared of some areas which appeared to be suitable for a comparative evaluation. Several were made of each sample. They were all printed at 40X onto 8430 film and processed at the same conditions.

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